

Memorandum

To: Leslie Sims, Linda Kiefer, EPA RPMs, Lowry Landfill Superfund Site
From: Tim Shangraw (EMSI) and Lynn Robbio-Wagner (TCHD)
Cc: Steve Richtel (WM), Dave Wilmoth (Denver)
Date: March 5, 2018, Rev June 1, 2020
Re: **Evaluation of Private Wells Identified as an Issue in the 2017 Five Year Review**

Purpose

On behalf of the City and County of Denver, Waste Management of Colorado, Inc., and Chemical Waste Management, Inc., hereafter referred to as the Work Settling Defendants (WSDs) and Tri-County Health Department (TCHD), this memo addresses the issue identified in the 2017 Five Year Review (FYR) for the Lowry Landfill Superfund Site (EPA, 2017) regarding the four private or municipal wells located within the footprint of the 1,4-dioxane plume and one well located adjacent to the plume. Specifically, the FYR recommendation called for sampling the wells and analyze for 1,4-dioxane and based on the results, implement appropriate remedial actions. A map illustrating the well locations in Sections 19 and 30 relative to the off-Site plume is presented as Figure 1.

As discussed in the conclusions section, the only private drinking water wells within or near the footprint of the North End Plume are the two private wells, [REDACTED] and [REDACTED] wells. Both have been sampled annually since 2006 and 1,4-dioxane has never been detected. Hence, no remedial actions are necessary. This memo provides the background and process followed to come to this conclusion.

Background

TCHD is the local health department with jurisdiction over the Lowry Landfill Superfund Site. TCHD's Lowry Landfill Superfund Site Oversight Program provides oversight and monitors the groundwater, air pollution emissions, and waste handling activities related to remediation of the Lowry Landfill Superfund Site (the Site) to verify that public health and the environment are protected. As a part of this program and since 2006, TCHD has identified and sampled private domestic water supply wells within the North End Plume in collaboration with the WSD as outlined in TCHD's *Work Plan for Sampling of Offsite Private Wells* (TCHD, March 2006). No municipal wells exist within the area of study. The term private well refers to a privately owned domestic water supply well. Private water systems that serve no more than 25 people at least 60 days of the year and have no more than 15 service connections are not regulated by the EPA.

In 2006, TCHD and the WSDs researched property owner records and conducted field investigations to locate wells that could potentially be impacted by the off-Site 1,4-dioxane plume. TCHD and the WSDs have voluntarily sampled the only two identified domestic water supply wells in proximity to the North End Plume every year since for 1,4-dioxane and other parameters. It should be noted that the TCHD off-Site sampling program is limited to monitoring of existing private water supply wells; it does not address delineation of the nature and extent of the 1,4-dioxane plume. That work is performed by the WSDs in accordance with work plans approved by the USEPA.

Off-Site Private Well Sampling Work Plan

The off-Site private well sampling work is performed by scientists from TCHD in collaboration with Lowry Landfill site personnel. Sample collection and analytical parameters are found in TCHD's *Work Plan for Sampling of Offsite Private Wells*. The primary objectives of the off-Site private well sampling activities are to:

1. Determine if private wells (private drinking water wells) within the potential groundwater flow path north of the Site have been impacted by 1, 4-dioxane, and
2. Assess the general water chemistry from those private wells to help evaluate the integrity of the well casings.

These objectives are being addressed by the following tasks:

1. Identify landowners with private wells in the Murphy Creek drainage downgradient from the Site that could be impacted by contaminated groundwater from the Site.
2. Select analytical parameters, including, but not limited to, 1,4-dioxane
3. Sample identified private wells
4. Evaluate and report results, and provide public education and outreach to well owners

Identifying landowners and activities

In February 2006, EPA, CDPHE, TCHD and WSD staff jointly performed field work to identify wells, new development, and engineered structures in the vicinity of the Murphy Creek drainage, including the area of the Murphy Creek Golf Course and the Murphy Creek neighborhood. A photo log of this joint field effort is included in Appendix A.

In conjunction with TCHD's *Work Plan for Sampling of Offsite Private Wells*, the WSDs conduct well surveys every 5 years in accordance with the Site's *Revision 2, Groundwater Monitoring Plan (GWMP)* (EMSI, 2018).to determine if there is new activity downgradient from the Site that could be impacted by the 1,4-dioxane plume. The survey consists of reviewing the Colorado Division of Water Resources well permits within ½ mile north, east, and west of the Site, and 5 miles north (downgradient) from the Site. If new wells within the plume area are identified they are field located and property owners are contacted. If new wells are identified between well research, TCHD and the WSDs work jointly to conduct field surveys to verify the records and locate wells. TCHD tracks well locations and works with landowners by providing proper wellhead protection and well closure guidance.

Current Private Well Identification Efforts

To meet the requirement of the FYR recommendation, TCHD and the WSDs followed the processes laid out in the *Work Plan for Sampling of Offsite Private Wells* and the *GWMP* by conducting a well permit record search, which is discussed in the proceeding section, then a field inspection to physically locate the wells of interest. On October 19th and 20th, 2017, TCHD and the WSDs consultant conducted a field inspection in the area. Shortly after the field inspection, the WSDs consultant returned to geo-locate the [REDACTED], and Murphy Creek Development Corp. (formerly [REDACTED]) wells to provide accurate geographical locations, as shown on Figure 1.

Record search

Below is a summary of the most recent well search from the Colorado Division Water Resources (DWR) well permit search page (<https://dwr.state.co.us/Tools/WellPermits>) for Range 65 West, Township 4 South Sections 19 and 30 as of March 1, 2018. The search identified 11 records in Section 19 and 6 records in Section 30, as seen in the screenshots from the DWR well permit search database, below.

Table 1- DWR Well Permit Search in Section 19

Viewing 1 - 11 of 11 Results

	Receipt	Permit	Q40	Q160	Sec	TS	RNG	PM	Owner/Applicant	Subdivision
View	0203866B		NE	NE	19	4S	65W	S	[REDACTED]	
View	0046414	46414-MH -	NE	NE	19	4S	65W	S	AURORA CITY OF	MURPHY CREEK
View	0047606N	276371--	NE	NE	19	4S	65W	S	AURORA CITY OF	
View	0203866C		NW	NW	19	4S	65W	S	[REDACTED]	
View	0203866A		SW	SE	19	4S	65W	S	[REDACTED]	
View	0026653	26653-MH -		SW	19	4S	65W	S	AURORA CITY OF	
View	9005756	[REDACTED]	NW	SW	19	4S	65W	S	[REDACTED]	
View	9006010	[REDACTED]	SW	SW	19	4S	65W	S	[REDACTED]	
View	9006444	[REDACTED]	SW	SW	19	4S	65W	S	[REDACTED]	
View	0393820F	192180--	SW	SW	19	4S	65W	S	AURORA CITY OF	
View	0393820G	192181--	SW	SW	19	4S	65W	S	AURORA CITY OF	

Export Results

Table 2 - DW Well Permit Search in Section 30

Viewing 1 - 6 of 6 Results

	Receipt	Permit	Q40	Q160	Sec	TS	RNG	PM	Owner/Applicant	Subdivision
View	0448675		NE	NE	30	4S	65W	S	[REDACTED]	
View	9006895	[REDACTED]	NW	NE	30	4S	65W	S	[REDACTED]	
View	9006472	22246--	SE	NW	30	4S	65W	S	BUCKLEY INVESTMENT COMP	
View	0017982	17982-MH -		SE	30	4S	65W	S	FDIC	
View	0017983	17983-MH -		SW	30	4S	65W	S	FDIC	
View	0020999	20999-MH -	SE	SW	30	4S	65W	S	SHELDON MICHAEL & ASSOCIATES	

Export Results

The record results were then screened to identify only private water supply wells. The criteria below were applied to eliminate entries in the DWR database that are not indicative of private water supply wells.

- 1) If the well records indicate the well was permitted, but not actually drilled. Specifically, wells that have a “receipt” number, but no “permit” number are wells that were applied for, but never drilled. This applies to three wells in Section 19 (see Table 1) and one well in Section 30 (see Table 2). Note - the one well in Section 30 (██████ well) is actually the same well as the ██████ well in Section 30 (discussed next). DWR Records indicate ██████ took possession of the ██████ well in 1999;
- 2) If the DWR database contains duplicate records of the same well. As mentioned above, the ██████ wells in Section 30 are the same well (see Table 2);
- 3) If the wells are for groundwater monitoring only. Five wells in Section 19 are City of Aurora monitoring wells, and three wells in Section 30 are FDIC and M. Sheldon & Associates monitoring wells (see Tables 1 and 2). They are not private water supply wells; and
- 4) If the wells have been abandoned. Field reconnaissance of the ██████ well (permit ██████) in Section 19 (Table 1) and the Buckley Investment Company well (permit 22246) in Section 30 (Table 2) indicate these two wells have been abandoned. Photographic evidence is provided below. Another former ██████ well in Section 19 (permit ██████) was identified as inactive and partially abandoned. Photographic evidence of that well is also provided below. That well will need to be properly abandoned (discussed further below).



Abandoned ██████ well (permit ██████)



Abandoned Buckley Invest. Co. well (permit 22246)



Partially abandoned former [REDACTED] well (permit [REDACTED])



Former [REDACTED] well (permit [REDACTED]) is blocked by what appears to be grout starting 141-inches below top of surface casing. The well is not usable.

Locations of active and inactive supply wells are shown on Figure 1. Cross-reference numbers to Figure 1, and details of each supply well are summarized in Table 3 indicating which wells were identified as not a concern based on the above criteria and the subsequent field identification effort.

Table 4 shows the resulting two private wells, the [REDACTED] and [REDACTED] wells, and the inactive, partially-abandoned former [REDACTED] well. Both of the two active, private wells are completed at depths starting at or below 357 feet bgs. The inactive, partially-abandoned [REDACTED] well is not usable, as discussed and photographed above. TCHD is working with the current owner (Murphy Creek Development Corp) to have them properly abandon the well.

Well Sampling Program

The two active domestic wells in Sections 19 and 30 are sampled annually by both TCHD and the WSDs for 1,4-dioxane as well as pH, nitrate, fluoride, specific conductance, and total dissolved solids. Sampling has been performed since 2006 in accordance with the *Work Plan for Sampling of Offsite Private Wells*. 1,4-dioxane has never been detected in either well. Results are reported in the Lowry Landfill Superfund Site Semi-Annual O&M Status Reports. TCHD reviews the other water quality parameters for indications of the well construction integrity. To date, results have indicated good well integrity.

Table 3 - Offsite Wells from DWR Search

	DWR Receipt No.	Permit No.	Well ID Shown on Figure 1.	Owner/Applicant	Section	Use	Reason for exclusion
1	0047606N	276371	2027	AURORA CITY OF	19	Monitoring/Sampling	Not a water supply well
2	0203866B	NA	NA	██████████	19	Commercial	Permit application only; not drilled
3	46414	46414	Not shown	AURORA CITY OF	19	Monitoring/Sampling	Not a water supply well
4	0203866C	NA	NA	██████████	19	Commercial	Permit application only; not drilled
5	0203866A	NA	NA	██████████	19	Commercial	Permit application only; not drilled
6	26653	26653	Not shown	AURORA CITY OF	19	Monitoring/Sampling	Not a water supply well
7	9005756	████	2082	██████████	19	Domestic	Partially abandoned and apparently grouted. Not usable
8	9006444	████	2085	██████████	19	Domestic	
9	0393820F	192180	Not shown	AURORA CITY OF	19	Monitoring/Sampling	Not a water supply well
10	0393820G	192181	Not shown	AURORA CITY OF	19	Monitoring/Sampling	Not a water supply well
11	9006010	12763	8084	██████████	19	Domestic	Field verified abandoned; DWR record does not indicate
12	448675	NA	2344	██████████████████	30	Domestic	The █████ and █████ wells in Section 30 are the same well; █████ and █████ registered the existing █████ well to themselves in 1999.
13	9006895	████	2344	██████████	30	Domestic	
14	9006472	22246	2273	BUCKLEY INVESTMENT COMP	30	Stock	Field verified abandoned; DWR record does not indicate
15	17982	17982	Not shown	FDIC	30	Monitoring/Sampling	Not a water supply well
16	17983	17983	Not shown	FDIC	30	Monitoring/Sampling	Not a water supply well
17	20999	20999	Not shown	SHELDON MICHAEL & ASSOCIATES	30	Monitoring/Sampling	Not a water supply well

Table 4- Identified Private Wells

Well ID Shown on Figure 1.	Permit No.	Current Owner	Completion Interval	Use and Status
Section 19 Wells				
2082	6671	Murphy Creek Development Corp (previous owner [REDACTED])	385 to 595 ft below ground surface (bgs)	Partially abandoned domestic water supply. Inactive. Needs to be properly abandoned (see photos)
2085	[REDACTED]	[REDACTED]	400 to 600 ft bgs	Domestic water supply. Active
Section 30 Wells				
2344	[REDACTED]	[REDACTED]	357 to 545 ft bgs	Domestic water supply. Active

Conclusions

- 1) Wells in the Murphy Creek drainage downgradient from the Site that could be potentially impacted by contaminated groundwater from the Site have been identified.
- 2) In accordance with TCHD's *Work Plan for Sampling of Offsite Private Wells*, two private wells located north of the Site have voluntarily been sampled annually for 1,4-dioxane. Since sampling began in 2006, 1,4-dioxane has never been detected in either well. Other sampling parameters indicate good well integrity. TCHD, with support from the WSDs, will continue to sample and monitor these wells for any possible future impacts.
- 3) A third deep well, located in Section 19, is inactive and partially abandoned. It is not usable. TCHD is working with the current owner to properly abandon the well.
- 4) TCHD has and continues to perform community outreach and public education regarding protection of private wells. This includes monitoring for current and new well activity in the area of concern downgradient from the Site.

References and Resources

Engineering Management Support, Inc. (EMSI), 2018. Revision 2, Groundwater Monitoring Plan, Lowry Landfill Superfund Site, August 16, 2018.

TCHD, Is Your Well Well? <http://www.tchd.org/274/Water-Issues 2018>

TCHD, 2006. Work Plan for Sampling of Offsite Private Wells, Lowry Landfill Superfund Site, Tri-County Health Department, March 2006

USEPA, 1,4-Dioxane In Shallow Groundwater, Lowry Landfill Superfund Site March 2008

USEPA, Five Year Review Report, Third Review for Lowry Landfill Superfund Site Arapahoe County, Colorado, September 2012

USEPA, Fourth Five Year Review Report for Lowry Landfill Superfund Site Arapahoe County, Colorado, September 2017

USEPA, Lowry Landfill Superfund Site Update Announcement, September 2013

Colorado Division of Water Resources, Well Permit search <https://dwr.state.co.us/Tools/WellPermits>

APPENDIX A
Photos of February 2006 Joint Well Identification Field Effort

